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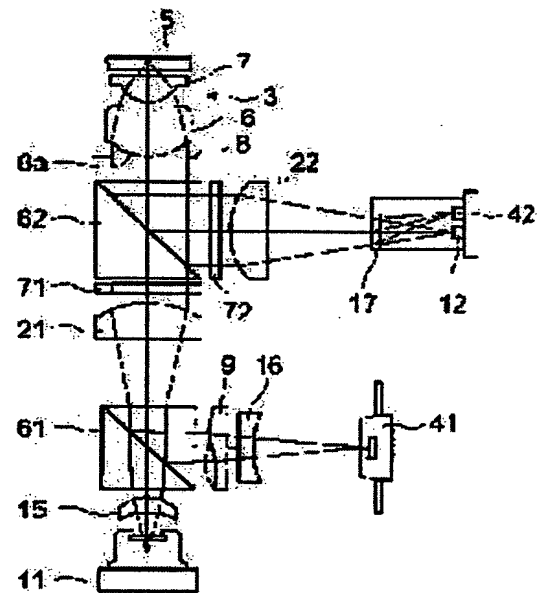
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(54) OBJECTIVE LENS AND OPTICAL PICKUP DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an objective lens for optical pickup whose aberration deterioration due to environmental change such as temperature change is restrained to be small and which is excellent in chromatic aberration and to provide an optical pickup device including the objective lens.

SOLUTION: This objective lens is the objective lens 3 for optical pickup, and is constituted of a 1st lens 6 having positive refractive power and a 2nd lens 1 having positive refractive power, and a resin layer having a diffraction surface is formed on the surface of at least one glass lens of the 1st and the 2nd lenses.



CLAIMS

[Claim(s)]

[Claim 1] The objective lens characterized by being an objective lens for optical pickups, having consisted of the 1st lens of forward refractive power, and the 2nd lens of forward refractive power, and forming in the front face of at least one glass lens of said 1st lens and said 2nd lens the resin layer which has a diffraction side.

[Claim 2] t1 and the need numerical aperture NA1 The 1st 0.75 or more optical information record media, [operating wavelength] [λ_1 and transparence substrate thickness] t2 and the need numerical aperture NA2 receive [λ_2 with operating wavelength larger 100nm or more than λ_1 , and transparence substrate thickness] the 2nd one or less-NA optical information record medium. The objective lens according to claim 1 characterized by amending wave aberration to the flux of light of each need numerical aperture below at 0.07 λ (lambda being each wavelength λ_1 and λ_2).

[Claim 3] The objective lens according to claim 2 with which wave aberration is characterized by being size from 0.07 λ_{rms} to the flux of light of numerical aperture NA1 to said 2nd optical information record medium.

[Claim 4] The lens in which said resin layer was formed is an objective lens according to claim 1, 2, or 3 characterized by being a spherical lens.

[Claim 5] The objective lens according to claim 1 characterized by satisfying a degree type. $0.90 \leq d_1/f \leq 2.00$, however d_1 : -- shaft top lens thickness f: focal distance R1: of the 1st lens -- the time of page [1st] paraxial radius of curvature and a diffraction side -- paraxial radius-of-curvature n1: of a base side -- the refractive index [claim 6] in d line of the glass lens member of the 1st lens It consists of a single ball lens of the forward refractive power in which the resin layer which is an objective lens for optical pickups and has a diffraction side on the surface of a glass lens was formed. t1 and the need numerical aperture NA1 The 1st 0.60 or more optical information record media, [operating wavelength] [λ_1 and transparence substrate thickness] t2 and the need numerical aperture NA2 receive [λ_2 with operating wavelength larger 100nm or more than λ_1 , and transparence substrate thickness] the 2nd one or less-NA optical information record medium. The objective lens characterized by amending wave aberration to the flux of light of each need numerical aperture below at 0.07 λ (lambda being each wavelength λ_1 and λ_2).

[Claim 7] The objective lens according to claim 6 with which wave aberration is characterized by being size from 0.07 λ_{rms} to the flux of light of numerical aperture NA1 to said 2nd optical information record medium.

[Claim 8] The objective lens according to claim 6 characterized by satisfying a degree type. $0.30 \leq R_1/(n-f) \leq 0.60$, however R1: -- the time of page [1st] paraxial radius of curvature and a diffraction side -- refractive-index f: in d line of the paraxial radius-of-curvature n: glass lens member of the mother aspheric surface or a mother bulb side -- a focal distance [claim 9] The objective lens according to claim 6, 7, or 8 characterized by satisfying a degree type.

$2.0 \leq n \leq 3.0$, however n: The refractive index in d line of a glass lens member [claim 10] Optical pickup equipment characterized by having provided the light source, the objective lens which condenses the light from said light source to an optical information record medium, and the electric eye which receives the light from said optical information record medium, and for said objective lens having consisted of the 1st lens of forward refractive power, and the 2nd lens of forward refractive power, and forming in the front face of at least one glass lens of said 1st lens and said 2nd lens the resin layer which has a diffraction side.

[Claim 11] t1 and the need numerical aperture NA1 The 1st 0.75 or more optical information record media, [said objective lens] [operating wavelength] [λ_1 and transparence substrate thickness] t2 and the need numerical aperture NA2 receive [λ_2 with operating wavelength larger 100nm or more than λ_1 , and transparence substrate thickness] the 2nd one or less-NA optical information record medium. Optical pickup equipment according to claim 10 characterized by amending wave aberration to the flux of light of each need numerical aperture below at 0.07 λ (lambda being each wavelength λ_1 and λ_2).

[Claim 12] Optical pickup equipment according to claim 11 with which wave aberration is

characterized by said objective lens being size from $0.07\lambda_{2rms}$ to the flux of light of numerical aperture NA1 to said 2nd optical information record medium.

[Claim 13] The lens in which said resin layer was formed is optical pickup equipment according to claim 10, 11, or 12 characterized by being a spherical lens.

[Claim 14] Optical pickup equipment according to claim 10 characterized by said objective lens satisfying a degree type.

$0.90 \leq d_1/f \leq 2.00$, $0.50 \leq R_1/(n_1 \text{ and } f) \leq 2.00$, however d_1 : -- shaft top lens thickness f : focal distance R_1 : of the 1st lens -- the time of page [1st] paraxial radius of curvature and a diffraction side -- paraxial radius-of-curvature n_1 : of a base side -- the refractive index [claim 15] in d line of the glass lens member of the 1st lens The light source and the objective lens which condenses the light from said light source to an optical information record medium, The electric eye which receives the light from said optical information record medium is provided. Said objective lens It consists of a single ball lens of the forward refractive power in which the resin layer which has a diffraction side on the surface of a glass lens was formed. t_1 and the need numerical aperture NA1 The 1st 0.60 or more optical information record media, [operating wavelength] [λ_1 and transparence substrate thickness] t_2 and the need numerical aperture NA2 receive [λ_2 with operating wavelength larger 100nm or more than λ_1 , and transparence substrate thickness] the 2nd one or less-NA optical information record medium. Optical pickup equipment characterized by amending wave aberration to the flux of light of each need numerical aperture below at $0.07\lambda_{darms}$ (λ being each wavelength λ_1 and λ_2).

[Claim 16] Optical pickup equipment according to claim 15 with which wave aberration is characterized by said objective lens being size from $0.07\lambda_{2rms}$ to the flux of light of numerical aperture NA1 to said 2nd optical information record medium.

[Claim 17] Optical pickup equipment according to claim 15 with which said objective lens is characterized by satisfying a degree type.

$0.30 \leq R_1/(n-f) \leq 0.60$, however R_1 : -- the time of page [1st] paraxial radius of curvature and a diffraction side -- refractive-index f : in d line of the paraxial radius-of-curvature n : glass lens member of the mother aspheric surface or a mother bulb side -- a focal distance [claim 18] Optical pickup equipment according to claim 15, 16, or 17 with which said objective lens is characterized by satisfying a degree type.

$2.0 \leq n \leq 3.0$, however n : d line part refractive index of a glass lens member [claim 19] Optical pickup equipment according to claim 11, 12, 15, 16, 17, or 18 with which said electric eye is characterized by preparing more than one corresponding to said 1st optical information record medium and said 2nd optical information record medium.

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